

# Philippine Dryopteris

by

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## Summary

A key to the thirteen recognized Philippine species of *Dryopteris* is presented, with descriptions of two new species, *D. uropinna* and *D. permagna*, and four species not hitherto reported as Philippine: *D. chrysocoma*, *D. pulvinulifera*, *D. polita*, and *D. formosana*. *Ctenitis mearnsii* is reduced to *Nothoperanema hendersonii*.

The genus *Dryopteris* Adanson (nom. cons.) is here circumscribed in the strict sense adopted by most recent authors, with its nearest relatives in Asia being along one lineage *Arachniodes* and on another *Nothoperanema*. *Dryopteris* consists of about two hundred species, mostly north subtropical and temperate, with the centre of diversity the Himalayan-East Asian region. Distinguishing characters of the genus are:

Rhizome short-erect, infrequently short-creeping, stipes with 5 or more vascular bundles at base, axes grooved above, junctions between grooves of different orders of axes open, lamina pinnate to quadripinnate, architecture usually anadromous at proximal base, then catadromous upwards and outwards, or infrequently anadromous throughout. Hairs not acicular, nor multicellular and erect, margins not bearing long sharp cartilaginous teeth, sinuses without cartilaginous membranes or protuberances, veins free, not reaching margin. Sori along veins, round, receptacles strongly raised, indusium round-reniform with a short sinus, somewhat stalked (rarely much reduced), paraphyses usually present, spores monolete, variously winged, bullate, or tuberculate.

*Arachniodes* is always rather strongly anadromous throughout, with dimidiate pinnules (basiscopic base excised), and usually with sharp cartilaginous teeth. It is, however, extremely difficult to formulate a verbal boundary; among Philippine plants *Arachniodes hasseltii* has blunt or rounded segments and *Dryopteris pulvinulifera* and *D. subarborea* are anadromous.

*Nothoperanema* has often been immersed in *Dryopteris* or *Ctenitis*. It agrees with *Dryopteris* in soral characters but is vegetatively similar to *Peranema* and *Diacalpe*, and thence to *Acrophorus* and *Stenolepia*. The patent stipe paleae, erect *Diacalpe*, and thence to *Acrophorus* and *Stenolepia*. The patent stipe paleae, erect conical multiseptate hairs on lamina, and fine dissection clearly mark the genus. It might more properly be reduced to *Peranema* (as has *Diacalpe*) than *Dryopteris*. Since *Nothoperanema* has not been reported by name from the Philippines, I provide below a brief synonymy and description of the one Philippine species:

**Nothoperanema hendersonii** (Bedd.) Ching, Acta Phytotax. Sinica 11 (1966) 28.  
— *Lastrea hendersonii* Bedd., Ferns Brit. India Suppl. (1876) 17, t. 377. —  
*Dryopteris hendersonii* (Bedd.) C. Chr., Ind. Fil. (1905) 270; Tagawa, Acta Phytotax. Geobot. 6 (1937) 155. — *Ctenitis mearnsii* Copel., Philip. J. Sci. 81 (1952) 24; Fern Fl. Philip. 2 (1960) 289.

Rhizome ascending, paleae brown, to  $18 \times 3$  mm, concolorous, with minute marginal projections. Stipes bright brown, to 70 cm long and 8 mm thick at base, paleae linear, patent, brown, subentire. Lamina subquadripinnate, to 70 cm long, ovate-deltoid, anadromous in sequence of pinnules at base, upwards catadromous, rachis with reduced linear patent paleae, these grading to stout conical erect multiseptate hairs forming a tuft inside rachis groove at junctions, also along costae, costules, and veins both sides of lamina; texture thin papyraceous. Basal pinnae to 30 cm long, stalk 3 cm, apex acuminate; basal basisopic pinnule to 9 cm, secondary pinnules very deeply lobed. Middle pinnae ascending, 12-17 cm long, acuminate, stalk 5-10 mm, basal pinnules c.  $3 \times 1.7$  cm, secondary pinnules adnate, blunt, shallowly lobed or crenate-serrate, apex toothed. Sori inframedial, indusium dark brown, minutely farinose, 0.7 mm across.

LUZON. Mt Pulog, *Curran et al. FB 16277* (MICH), *Jacobs 7301* (A, CAHUP, PNH); Mt Burnay, *Iwatsuki et al. P-774*; Benguet, Pauai, *McGregor BS 8507* (MICH); Haight's Place, *Mearns BS 4216* (MICH), *4218* (MICH); Mt Singakalsa, *Celestino & Castro PNH 3971* (MICH); Mt Santo Tomas, *Price 1868*; Bulasan, *Copeland s.n. 7 May 1913* (MICH).

*Ecology*: Terrestrial in mountain forests, 1900-2700 m.

*Distribution*: N. India, Nepal, S. China, Japan, Thailand, Java.

Most of the Philippine species of *Dryopteris* are found in the Benguet highlands of Luzon; none were collected by botanists until the 1890s. It is likely that additional species remain to be discovered in the mountains of northern Luzon.

Aside from the delimitation of *Dryopteris* from *Arachniodes*, the greatest difficulty still remaining is the proper treatment of the *D. subarborea* complex (species 11-13 below). There are at least three Philippine taxa but their relationship with plants from elsewhere in Malesia and Polynesia remains to be ascertained. I am not sure that I have applied the names *D. subarborea* and *D. purpurascens* correctly.

Instead of a full synonymy, I have provided all Philippine references, original and basonym citations, and reference to important descriptions. Philippine specimens I have seen are cited; duplicates of my own collections are being distributed. Ecological information is based on Philippine conditions.

#### KEY TO THE PHILIPPINE SPECIES OF *DRYOPTERIS*

1. Indusium c. 2 mm across, persistently helmet-shaped; rhizome paleae orange-colored
  2. Fronds dimorphic (the fertile lamina contracted), deltoid-ovate, not glandular ..... 1. *D. cochleata*
  2. Fronds uniform, lanceolate, bearing small capitate glandular hairs on axes, lamina, and indusia ..... 2. *D. chrysocoma*
1. Indusium exceptionally to 1.5 mm across, shriveling; paleae not orange
  3. Lamina lanceolate or narrower, pinnate or bipinnatifid; basal pinnae similar to middle pinnae
    4. Pinnae toothed or shallowly lobed ..... 3. *D. hirtipes*
    4. Pinnae lobed nearly to costa ..... 4. *D. wallichiana*
  3. Lamina ovate or deltoid-ovate, at least bipinnate; basal pinnae more dissected than middle pinnae, considerably longer and/or broader

5. Lamina to c. 50 cm long
  6. Lamina anadromous throughout; rhizome short-creeping, paleae golden-brown, acicular ..... 5. *D. pulvinulifera*
  6. Lamina catadromous above base; rhizome short-erect, paleae brown or black
    7. Stalks of basal pinnae over 15 mm long; indusium minute ..... 6. *D. polita*
    7. Stalks of basal pinnae 10 mm or less long; indusium evident
      8. Paleae of rhizome and stipe pale brown, very thin, lanceolate or ovate; rachis groove strongly papillate within ..... 7. *D. sparsa*
      8. Paleae at least partially black, not thin, linear or narrowly lanceolate; rachis groove not papillate
        9. Basal basiscopic pinnule of basal pinnae about equal to succeeding basiscopic pinnules ..... 8. *D. uropinna*
        9. Basal basiscopic pinnule much enlarged
          10. Pinnules mostly somewhat falcate (costules ascendingly curved) ..... 9. *D. varia*
          10. Pinnules never falcate (costules not arcuate) ..... 10. *D. formosana*
  5. Lamina over 100 cm long
    11. Rhizome short-creeping; lamina glabrous ..... 11. *D. subarborea*
    11. Rhizome short-erect; lamina with appressed multi-cellular hairs beneath
      12. Sori containing conspicuous paraphyses with large yellow cylindric heads ..... 12. *D. purpurascens*
      12. Paraphyses inconspicuous, hyaline, shorter than sporangia, heads not or only very slightly expanded ..... 13. *D. permagna*

1. *Dryopteris cochleata* (Don) C. Chr., Ind. Fil. (1905) 258; Ching, Bull. Fan Mem. Inst. Biol. Bot. 8 (1938) 434; Copel., Fern Fl. Philip. 2 (1960) 282. — *Nephrodium cochleatum* Don, Prod. Fl. Nepal. (1825) 6. — *D. heleopteroides* Christ, Philip. J. Sci. 2C (1907) 212; Merrill & Merritt, Philip. J. Sci. 5C (1910) 317.

LUZON, Benguet, *Bacani* FB 15962 (MICH), *Copeland* 1837a (MICH), *Hernaez* CAHUP 13898, *Price* 1146, 1823, 1827, *Ramos* BS 5813 (NY, US, MICH), *Williams* 1502 (NY, US); Bontoc, *Vanoverbergh* 3343 (F); Ilocos Norte, *Iwatsuki et al.* P-113, P-151, P-221, *Price* 3341.

**Ecology:** Rhizome short-creeping, terrestrial or on limestone. 200-1800 m, in fairly open seasonally dry grassland, under pine forest, or at borders of secondary growth, in sites with good drainage, cool nights, and no wind.

**Notes:** Copeland described *D. cochleata* as glabrous but the lamina beneath has appressed multicellular hairs identical to apices of paleae.

**Distribution:** S. China (not Taiwan), India, Nepal, Burma, Thailand, N. Vietnam, Java, Bali.



2. *Dryopteris chrysocoma* (Christ) C. Chr. Ind. Fil. (1905) 257; Ching, Bull. Fan Mem. Inst. Biol. Bot. 8 (1938) 436. — *Aspidium filix-mas* var. *chrysocoma* Christ, Bull. Herb. Boiss. 6 (1898) 966.

Rhizome short-creeping, paleae c. 1.5 cm long, narrow, orange-brown, colorous, cells very long and slender, margins with minute regular projections. Stipe 20 cm × 3 mm, stramineous, bearing broadly ovate paleae 5 × 2.5 mm and reduced narrow paleae. Lamina lanceolate, 35 × 15 cm, bipinnate throughout, thick herbaceous, catadromous except at base, both surfaces and axes bearing erect capitate orange glandular hairs, rachis beneath also with narrow orange-brown paleae. Pinnae linear-lanceolate, basal slightly reduced, 17 pairs, to 9 × 2.7 cm, abruptly narrowed to the acute apex. Pinnules c. 12 × 6 mm, sessile but not adnate (base narrow), apices broad, rounded, with numerous small teeth. Indusia 2.5 mm across, persistent, convex, orange-brown, bearing numerous capitate orange glandular hairs.

LUZON. Benguet, Haight's Place, July 1907, *Mearns BS 4219* (MICH).

*Ecology*: Terrestrial, c. 2100 m; only one Philippine collection.

*Notes*: Very small plants may be fertile.

*Distribution*: S. China, N. India & Pakistan, Burma. Reported from Taiwan by Tagawa, Acta Phytotax. Geobot. 8 (1939) 22, but not mentioned in the recent Flora of Taiwan.

3. *Dryopteris hirtipes* (Bl.) O. Ktze., Rev. Gen. Pl. 2 (1891) 813; Christ, Philip. J. Sci. 2C (1907) 212; Merrill & Merritt, Philip. J. Sci. 5C (1910) 317; Copel., Leaf. Philip. Bot. 3 (1910) 806; Fern Fl. Philip. 2 (1960) 281; Holttum, Ferns of Malaya, ed. 2 (1966) 635; Sledge, Bull. Brit. Mus. (Nat. Hist.) Bot. 5 (1973) 6. — *Aspidium hirtipes* Bl., Enum. Pl. Jav. (1828) 148; Christ, Bull. Herb. Boiss. 6 (1898) 194. — *Nephrodium hirtipes* (Bl.) Hook.; Copel., Polyp. Philip. (1905) 21.

LUZON. Bontoc, *Vanoverbergh 3146* (F); Mt Data, *Copeland 1887* (MICH), *Price 389, 395, 402*; Mt Pulog, *Celestino et al. PNH 3026* (MICH), *Curran et al. FB 16278* (MICH); Mt Polis, *Price 422, 436*; Mt Singakalsa, *Celestino & Castro PNH 3981* (MICH); Mt Santo Tomas, *Price 1006, Topping 1187* (NY); Pauai, J. K. Santos *BS 31667* (US); Benguet, *Elmer 6529* (NY, US), *Price 1672, Topping 248* (GH, US), *302* (GH, US), *303* (MICH, US), *311* (NY, US); Mt Ragut, *Loher 850* (US).

MINDANAO. Davao, Mt Calelan, *Elmer 10799* (F, GH, MICH, NY, US); Mt Apo, *Copeland s.n.* 27 Oct 1904 (MICH); Cotobato, Mt Matutum, *Copeland s.n.* 1 May 1917 (MICH).

*Ecology*: Terrestrial in mountain forest, 1350-2650 m.

*Notes*: Dimensions more variable than hitherto reported, in Philippine material stipes 12-63 cm, lamina 14-73 cm long, pinnae 2.3-24 × 0.8-3.5 cm. *Topping 311* at NY is aberrant in having irregularly anastomosing veins. Reports of this species from Mt Arayat (Christ 1898, Copeland 1905, 1960) are based on erroneous localization of *Loher 850*, Feb. 1894, by Christ (1898); the specimen in US bears the same date and elevation (1950 m) as Christ's published report but with the name Mt Ragut. Arayat is only about 1000 m high.

*Distribution*: Sri Lanka and India to S. China & Japan, Malesia, Samoa.

4. *Dryopteris wallichiana* (Spreng.) Hyl., Bot. Notis. 1953 (1953) 352; Alston, Amer. Fern J. 47 (1957) 92; Sledge, Bull. Brit. Mus. (Nat. Hist.) Bot. 5 (1973) 8. — *Aspidium wallichianum* Spreng., Syst. Veget. 4 (1827) 104. — *D. filix-mas* var. *parallelogramma* (Kunze) Christ, Philip. J. Sci. 2C (1907) 212; Merrill & Merritt, Philip. J. Sci. 5C (1910) 317. — *D. paleacea* (Sw.) C. Chr. nom. illegit.; Copel., Fern Fl. Philip. 2 (1960) 281.

LUZON, Mt Pulog, Curran *et al.* FB 16247 (MICH), Jacobs 7260 (A, CAHUP, PNH); Mt Data, Copeland 1875 (MICH).

*Ecology*: Terrestrial in wet mountain forest, 2100–2800 m.

*Notes*: Alston (1957) distinguished the tropical American *D. parallelogramma* from the Asian *D. wallichiana* by only the color of the rhizome scales, which I find to be unreliable. Christensen, Cont. U. S. Nat. Herb. 26 (1931) 280, stated: "... a close comparison of very complete specimens ... has shown me that it is impossible to find one stable character by which they may be distinguished." The genus *Dichasium* (A. Br.) Fée was established for plants of this species.

*Distribution*: Sri Lanka, India, Nepal, Burma, S. China & Taiwan, Japan, Java, N. Borneo, New Guinea, Hawaii, Mexico, Cuba, Jamaica, Hispaniola, Guatemala, Costa Rica, Panama, Colombia, Venezuela, Ecuador, Peru, Brazil, Bolivia, Argentina, Rhodesia, Madagascar.

5. *Dryopteris pulvinulifera* (Bedd.) O. Ktze. Rev. Gen. Pl. 2 (1891) 813; Ching, Bull. Fan Mem. Inst. Biol. Bot. 8 (1938) 466; Sledge, Bull. Brit. Mus. (Nat. Hist.) Bot. 5 (1973) 10. — *Lastrea pulvinulifera* Bedd., Ferns Brit. Ind. (1870) t. 333.

Rhizome short-creeping, paleae very narrow, bright golden-brown, glossy, c. 1 cm long, entire. Stipe bases swollen, fleshy, blackish, densely paleate; stipes to 34 cm long. Lamina deltoid-ovate, acuminate, to 49 cm long, tripinnate + pinnatifid at base, anadromous throughout, both surfaces with multiseptate dark appressed hairs and unicellular glossy hyaline appressed glandular hairs, rachis and costae with lanceolate blackish subclathrate paleae grading distally to bullate based. Pinnae to 18 free pairs, basal pinnae to 22 cm long, basal basiscopic pinnule to 7 cm long; larger pinnae gradually acuminate, pinnules acute, teeth of segments acute (not aristate nor cartilaginous). Sori subterminal on veins, about medial, indusia c. 1 mm across, reddish-brown, with multicellular hairs at base of sinus and minute fragile appressed glossy glandular hairs elsewhere and at margins.

LUZON, Mt Data, Copeland 1861 (MICH); Mt Santo Tomas, Price 1616, 1841; Mt Burnay, Iwatsuki *et al.* P-827, P-848, Price 3363.

*Ecology*: Terrestrial, rarely petrophytic among mosses, 1800–2200 m, on slopes and cliffs in mossy forest.

*Notes*: Extremely small fronds may be fully fertile; the smallest, such I have seen, is 4.5 cm long including stipe.

*Distribution*: Sri Lanka, N. E. India, Nepal.

6. *Dryopteris polita* Rosest., Fedde Repert. 13 (1914) 218; Holttum, Ferns of Malaya (1955) 492; DeVol & Kuo, Fl. Taiwan 1 (1975) 378.

Rhizome short-erect, paleae glossy, light brown, subentire, concolorous, to 13 × 2 mm. Stipe to 52 cm by 3 mm, stramineous. Lamina lanceolate-deltoid, 18–45 cm long, catadromous above base, bipinnate, texture firm herbaceous, beneath with multiseptate appressed reddish-brown hairs, axes with sparse narrow



fibrils. Pinnae narrowly lanceolate, acuminate, evenly tapering, broadest on basiscopic side; basal pinnae to 17 cm long, stalks 1.6–3.6 cm long, largest basal basiscopic pinnule to  $6.8 \times 1.8$  cm, lobed 4/5 to costule basally, most pinnules 4–9 mm broad with rounded apex. Sori medial, indusia minute, pale brown, completely concealed by mature sporangia, sporangial stalks dark reddish-brown basally, paraphyses none.

MINDANAO. Bukidnon, Mt Dumalucpihan, June-July 1920, *Ramos & Edaño BS 39031* (US).

*Ecology*: Terrestrial.

*Notes*: Rosenstock described this species from Sumatra as exindusiate and an isotype in NY is indeed without indusia. However, specimens from Thailand, S. Japan, the Philippines, and Papua clearly have very small indusia. In Fern Fl. Philip. 2 (1960) 283, Copeland cited the one Philippine specimen as an unnamed relative of *D. sparsa*.

*Distribution*: Thailand and Sumatra to S. Japan and Papua New Guinea.

7. *Dryopteris sparsa* (Don) O. Ktze., Rev. Gen. Pl. 2 (1891) 813; Christ, Philip. J. Sci. 2C (1907) 213; Merrill, Philip. J. Sci. 3C (1908) 390; Copel., Leaf. Philip. Bot. 2 (1908) 389; Fern Fl. Philip. 2 (1960) 283; Holttum, Ferns of Malaya (1955) 492, t. 292; Hatusima, Mem. Fac. Agr. Kagoshima Univ. 5 (1966) 22. — *Nephrodium sparsum* Don, Prod. Fl. Nepal. (1825) 6; Copel., Polyp. Philip. (1905) 24. — *Aspidium sparsum* (Don) Spreng.; Christ, Bull. Herb. Boiss. 6 (1898) 194.

BATAN ISLAND. Mt Iraya, *Hatusima & Sato 29055* (PNH).

LUZON. Banawe, *Banluga PNH 72907*; Mt Ugo, *Ramos BS 5836* (MICH, US); Mt Santo Tomas, *Price 1042, 1840*; Baguio, *Price 1578, Topping 222* (GH, US), 282 (MICH, US); Twin Peaks, *Bartsch 211* (US); Benguet, *Merrill 7779* (MICH, US); Mt Arayat, *Loher 1190* (US); Mt Banahaw, *Price 362*; Mt San Cristobal, *Price 804, 813, 839*; Mt Makiling, *Price 211, 366, 499, 2398*.

NEGROS. Mt Cuernos de Negros, *Elmer 9949* (F), *10100* (MICH), *Herre 1101* (NY), *Price 2612*.

PALAWAN. *Foxworthy BS 672* (MICH).

MINDANAO. Lanao, *Clemens s.n.*, July 1907 (F); Zamboanga, San Ramon, *Copeland 1727* (MICH, US); Bukidnon, Mt Camates, *Ramos & Edaño BS 38607* (US); Davao, Mt Apo, *Williams 2526* (NY).

*Ecology*: Terrestrial in mountain forests, 800–2100 m, descending to 400 m in everwet ravines at base of Mt Banahaw.

*Notes*: Occasional specimens have globular sessile yellow glands on the lower laminar surface, a character possibly controlled by a single allele. Examples are: *Herre 1101*, *Price 813, 1578, 2398*. *Price 1042* from high elevation on Mt Santo Tomas has maroon stipe and rachis. Similar plants have been named *D. sparsa* var. *nitidula* (Bedd.) Ching, Bull. Fan Mem. Inst. Biol. Bot. 8 (1938) 472.

*Distribution*: Sri Lanka & India to S. Japan and Papua New Guinea.

8. *Dryopteris uropinna* Price, sp. nov. — *Aspidium erythrosorum* auct. non Eaton: Christ, Bull. Herb. Boiss. 6 (1898) 193. — *Nephrodium erythrosorum* auct. non (Eaton) Hook.: Copel., Polyp. Philip. (1905) 24. — *D. erythrosora* auct. non (Eaton) O. Ktze.: Christ, Philip. J. Sci. 2C (1907) 211;

Copel., Fern Fl. Philip. 2 (1960) 283. — *D. subtriangularis* auct. non (Hope) C. Chr.: Ching, Bull. Fan Mem. Inst. Biol. Bot. 8 (1938) 485; Tard. & C. Chr., Fl. Gén. L'Indo-Chine 7 (1941) 315, fig. 35. — *D. labordei* auct. non (Christ) C. Chr.: DeVol & Kuo, Fl. Taiw. 1 (1975) 377, p.p.

Fig. 1

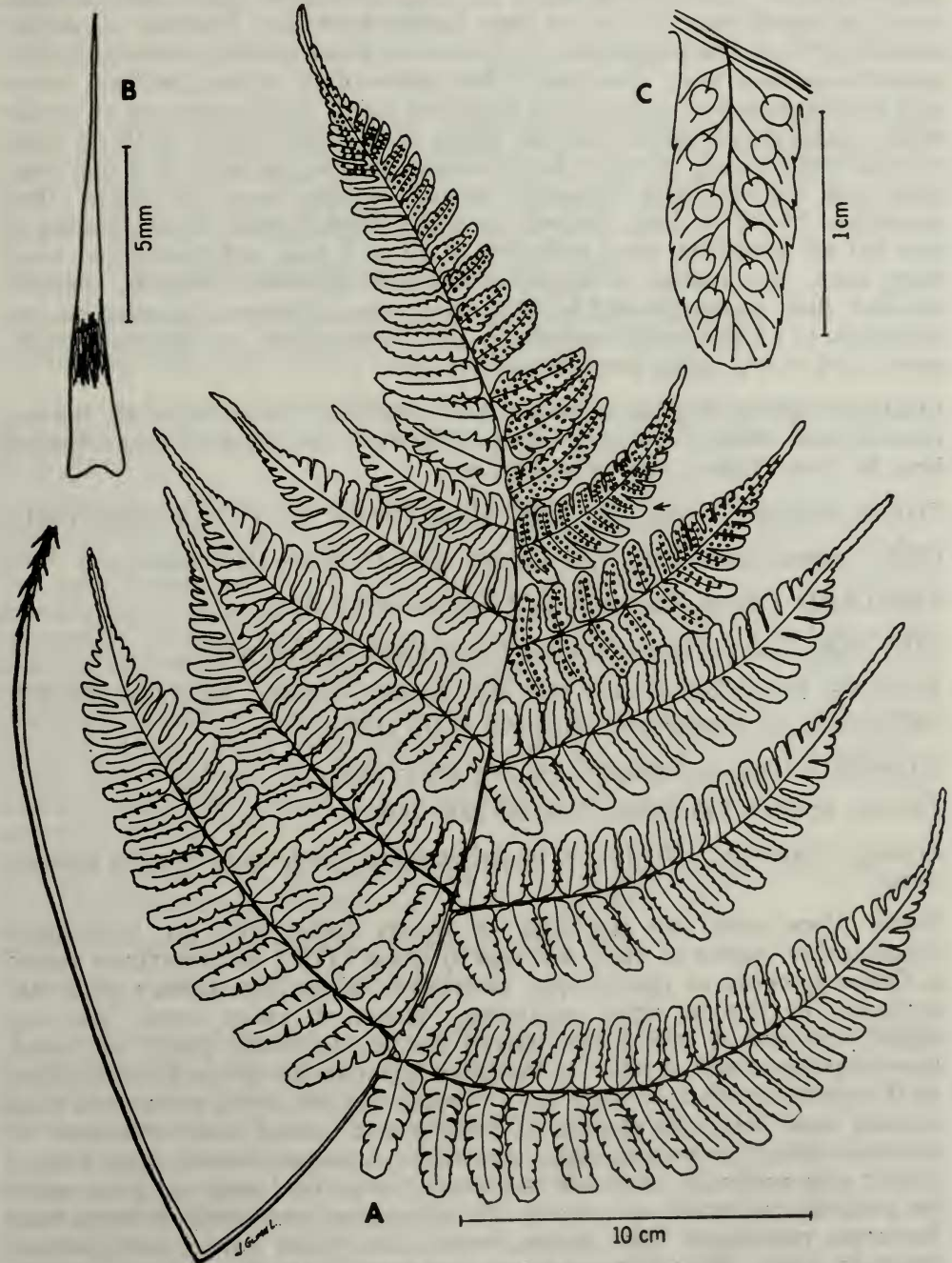


Fig. 1. *Dryopteris uropinna* Price, holotype. A. Frond. B. Stipe scale. C. Pinnule from upper pinna. (see arrow). Drawn by Ms. Janice Glimm Lacy.



Species e turma *D. erythrosorae*, ad *D. indusiata*m arcte accedens, differt magnitudine minore, ambitu subtriangulari, rhachidi glabrescenti, pinnulis late rotundati-truncatis, apicibus pinnarum frondisque abrupte contractis et caudatis.

HOLOTYPE: Luzon, Ilocos Norte, Mt Burnay, *Price 3364* (MICH).

Rhizome short-erect, paleae c.  $10 \times 1$  mm, linear, blackish with narrow brown margins, entire. Stipes brown, 14–34 cm long, glabrescent above base. Lamina deltoid to deltoid-ovate, 17–36 cm long, caudate-acuminate, bipinnate + deeply pinnatifid at base, thin papyraceous, dull brown or green, costae stramineous below, catadromous above base, above with a few narrow fibrils at axis junctions, below with small light brown bullate based acuminate paleae along costae and at costule bases, much-reduced septate hair-like paleae along veins. Pinnae to 16 cm long, broadest basiscopically, abruptly narrowed and caudate, on stalks to 4 mm long, basal pair longest; basal basiscopic pinnule slightly longer or shorter than succeeding, 1.5–4.1 cm long, shallowly to deeply lobed. Pinnules blunt, broadest at base but not auriculate, when undivided to  $20 \times 7$  mm, with well-spaced small sharp teeth. Sori medial or slightly inframedial, indusium orbicular, centrally attached, sinus nearly obscured by overlapping edges, glabrous, shriveling but not deciduous, to 1.5 mm across, paraphyses short, non-capitate, on sporangial stalks, spores dark brown, rather irregularly tuberculate.

LUZON. Lepanto, Bagnen, *Copeland 1929* (MICH); Ilocos Norte, Mt Burnay, *Iwatsuki et al. P-849, Price 3364*. Christ (1898, 1907) also cited a Loher collection from Mt Santo Tomas, Feb. 1894, 2250 m.

CHINA. Kwangsi, *Ching 6263* (NY, US); Yunnan, *H. T. Tsai 60474* (GH).

INDIA. Assam, Khasi Hills, 4000 ft., Oct. 1890, *G. Mann* (NY, US).

THAILAND. Udawn, *Tagawa et al. T-645, T-1297* (US).

VIETNAM. Cochinchina, *Cavalerie s.n.* ex Herb. Jeanpert (US).

TAIWAN. Taito, *Tagawa 2670* (MICH); Agyoku, Taihoku, *Suzuki 24* (MICH).

OKINAWA. Mt Yonahadake, *Hatusima 18371* (US).

RYUKYUS. Ishigaki, *Koidzumi, s.n.* July 1923 (US).

JAPAN. Kyushu, Yakushima, *Iwatsuki 3159* (US).

*Ecology*: Terrestrial, 1800–2250 m in sheltered well-lighted spots in moist montane forest.

*Notes*: Hope cited two specimens of Gustav Mann with his *Nephrodium subtriangulare*, neither of which was seen by Ching (1938) who mistakenly named a Clarke specimen as type. Hope's description differs from Ching's plant (*D. uropinna*) by rhizome scales castaneous, "pinnae all except lowest pair very slightly narrowed at base, lowest inferior pinnules on lowest pinnae very much shorter than next three or four." In Philippine literature this species has been known as *D. erythrosora* which however has a creeping rhizome, brown paleae, and much reduced basal basiscopic pinnules of basal pinnae, among other differences. *D. indusiata* differs by attaining larger dimensions, lanceolate outline, more strongly paleate stipe and rachis, segments narrower apically, frond apex and pinna apices not suddenly contracted and caudate. *D. labordei* has prominently enlarged basal basiscopic pinnules of basal pinnae, brown (not black) paleae, and gradually narrowed apices. The specimens above cited from Thailand and Japan differ in minor respects from the Philippine type. Some Japanese specimens appear to



intergrade with *D. indusiata*; they may be hybrids. Another similar species is represented by *Topping 1794* (US) from Mt Kinabalu; it differs by bullate scales absent, segments hardly toothed, basal basicopic pinnule not dissected.

*Distribution*: Himalayan region to S. Japan and Luzon.

9. ***Dryopteris varia*** (L.) O. Ktze., Rev. Gen. Pl. 2 (1891) 814; Ching, Bull. Fan Mem. Inst. Biol. Bot. 8 (1938) 490; Copel., Fern Fl. Philip. 2 (1960) 284. — *Polypodium varium* L., Sp. Pl. 2 (1753) 1090. — *Aspidium varium* (L.) Sw.; Christ, Bull. Herb. Boiss. 6 (1898) 192; *ibid.* II, 6 (1906) 996. — *Polystichum varium* (L.) Presl; Copel., Polyp. Philip. (1905) 18.

LUZON. Bontoc, *Madulid et al. PNH 113264, Vanoverbergh 624* (MICH); Ilocos Norte, *Iwatsuki et al. P-202, P-225, P-886, Price 3342, 3398*; Baguio, *Copeland 1959* (MICH), *Elmer 6489* (MICH, NY, US), *Hernaez CAHUP 13899, 13900, 13901, Price 386, 1677, Ramos BS 5795* (MICH, US), *Topping 177* (US), *Williams 1513* (NY, US); Mt Banahaw, *Price 882*.

*Ecology*: Terrestrial in seasonally dry forest, 700–1500 m.

*Notes*: The Banahaw collection is a new southern range extension.

*Distribution*: N.E. India, China, Korea, Japan.

10. ***Dryopteris formosana*** (Christ) C. Chr., Ind. Fil. (1905) 266; DeVol & Kuo, Fl. Taiwan 1 (1975) 376. — *Aspidium formosanum* Christ, Bull. Herb. Boiss. II, 4 (1904) 615.

Rhizome short-erect, paleae fuscous, concolorous, subentire, to  $20 \times 2.5$  mm. Stipes stramineous to brown, to 49 cm long, 6 mm thick at base, paleae blackish, entire. Lamina deltoid or deltoid-ovate, to 42 cm long, fully tripinnate at base, firm papyraceous, greyish-green, anadromous at proximal base, elsewhere catadromous. Rachis with reduced narrow blackish paleae, grooves with conical hairs at junctions, pinna-rachises, costae, and costules with small dark acuminate bullate-based paleae beneath, veins beneath with appressed multiseptate hairs. Basal pinnae to 19 cm long, stalk 9 mm, basal basicopic pinnule notably enlarged, to 13 cm, secondary pinnules to  $3.5 \times 1.1$  cm, tertiary pinnules to  $8 \times 3.5$  mm, adnate, minutely aristate; basal acroscopic pinnule to  $3.2 \times 1.7$  cm. Middle pinnae c. 13 cm long, acuminate, pinnules to 3.4 cm long, secondary pinnules adnate or confluent, aristate-denticulate. Sori about medial, indusium bright brown, to 1.3 mm across, glabrescent.

LUZON. Benguet Prov., Mt Santo Tomas. *Price 1117*; Ilocos Norte Prov., Solsona, *Price 2929*, Mt Burnay, *Iwatsuki et al. P-851, Price 3384*.

*Ecology*: Terrestrial in mountain forest, 1400–2100 m.

*Distribution*: Taiwan, Japan.

11. ***Dryopteris subarborea*** (Bak.) C. Chr., Ind. Fil. (1905) 295; Holttum, Ferns of Malaya (1955) 491, t. 291; Copel., Fern Fl. Philip. 2 (1960) 284, p.p. — *Polypodium subarboreum* Bak., J. Linn. Soc. Bot. 24 (1887) 259. — *D. purpurascens* auct. non (Bl.) Christ: Christ, Philip. J. Sci. 2C (1907) 213.

Rhizome short-creeping, c. 2.5 cm thick, paleae to  $20 \times 2$  mm, brown, concolorous, with marginal projections from one or two adjoining cells bearing a small globose pale deciduous gland. Stipe stramineous, sparsely paleate, to at least 55 cm long, 12 mm thick at base, with c. 12 vascular bundles forming a single ring interrupted by the adaxial groove. Lamina to at least 110 cm long, ovate, to fully quadripinnate basally, anadromous throughout or nearly so, thin papyraceous,

rachis with a few scattered appressed remnants of paleae, rachis groove, pinna-rachis grooves, and basal portion of pinnule grooves with minute erect capitate glandular hairs within, lamina otherwise glabrous. Basal pinnae to 60 cm long, stalk 1.5 cm to basal pinnule, apex acuminate, pinnules to 17 cm long, acuminate, secondary pinnules to  $4.5 \times 1.6$  cm, blunt or acute, the proximal pinnate or lobed with rounded undulate-toothed segments, grading distally to shallowly crenate-dentate. Middle pinnae c. 32 cm long, acuminate, stalk 1 cm, basal pinnules  $7.5 \times 3$  cm, secondary pinnules to  $1.6 \times 0.9$  cm. Sori medial to slightly supramedial, indusium brown, glabrous, smaller than sorus, 0.5 mm across, paraphyses with hyaline or yellow bead-shaped heads.

LUZON. Quezon, Real. Llavac, *Price 1494, 1499*; Laguna, Mt San Cristobal, *Copeland PPE 91* (GH, MICH); Mt Makiling, *Elmer 18067* (F, GH, NY), *Price 2988*.

MINDORO. Mt Halcon, *Merrill 6101* (MICH)?

CATANDUANES. *Ramos BS 30192* (US), *30223* (US), *30462* (US).

SAMAR. Gandara, *Price & Hernaez 158*.

PANAY. Capiz, Mt Bulilao, *Martelino & Edaño BS 35645* (US), *35652* (US), *35693* (US), *35730* (US).

*Ecology*: Epiphytic on trunks and large branches in wet forest, 300–1200 m.

*Notes*: I place here with doubt *Merrill 6101* known to me by a single sterile specimen pustular beneath. According to the field label, a Bornean specimen at Kew, matching the type, was also epiphytic with short-creeping rhizome (R. E. Holttum, in litt.). Related is the New Guinean *D. pseudoparasitica* v.A.v.R. with relatively slender and long-creeping rhizome and dimorphic fronds.

*Distribution*: Sumatra, Malaya, Borneo (Java?).

12. ***Dryopteris purpurascens*** (Bl.) Christ, Philip. J. Sci. 2C (1907) 213, nomen tantum; Copel., Leaf. Philip. Bot. 3 (1910) 807; Backer & Posthumus, Varenflora voor Java (1939) 47, p.p. — *Aspidium purpurascens* Bl., Enum. Pl. Jav. (1828) 169. — *Nephrodium divisum* auct. non Hook.: Copel., Polyp. Philip. (1905) 26. — *D. subarborea* auct. non (Bak.) C. Chr.: Christ, Philip. J. Sci. 2C (1907) 214, p.p.; Copel., Leaf. Philip. Bot. 3 (1910) 807; Fern Fl. Philip. 2 (1960) 284, p.p.

MINDANAO. Mt Apo, *Copeland 1138* (MICH, NY, US), *1614a* (MICH), s.n. 5 Sept. 1932 (MICH), *Elmer 11418* (MICH), *11550* (F, GH, MICH, NY, US), *11842* (F, GH, MICH, NY, US), *Williams 2479* (NY, US); Mt Matutum, *Copeland s.n.* 30 April 1917 (MICH), *Ramos & Edaño BS 85302* (GH).

*Ecology*: Terrestrial, petrophytic, or epiphytic on mossy trunks, 1500–2000 m.

*Notes*: *Elmer 11842* has a different appearance because of maroon color when dry and finer teeth of segments; it may represent another species. Mindanao specimens which I am treating as *D. purpurascens* differ from the next species, *D. permagna*, by being somewhat laxer and less dissected with broader usually deltoid teeth and inconsistently catadromous or anadromous architecture, as well as the paraphyses. The holotype of *Aspidium purpurascens* Bl. (photo MICH, US, Morton neg. 1304) consists of two separate pinnae evidently from the same frond. labeled as collected in the Moluccas by Zippelius. Blume's variety Beta (photo MICH, US, Morton neg. 1305) seems to be identical, possibly parts of the very same frond, consisting of a frond apex and the basal portion of a basal pinna, but is labeled Java, collector Blume. Both are quadripinnate, and anadromous throughout. While



no Philippine materials are an exact match to the type of *D. purpurascens*, I refrain from describing the Mindanao plant as new without further information. Among other subtle differences, Javan plants have relatively numerous persistent narrow paleae along axes below.

*Distribution:* Java, Celebes, Moluccas (Borneo?).

13. *Dryopteris permagna* Price, sp. nov. — *D. subarborea* auct. non (Bak.) C. Chr.: Christ, Philip. J. Sci. 2C (1907) 214, p.p.; Copel., Fern Fl. Philip. 2 (1960) 284, p.p.

Rhizoma crassum, erectum, paleis usque ad  $42 \times 7$  mm cellulis marginalibus aliquot eminentibus ferens. Stipites usque ad  $103 \times 1.2$  cm. Lamina subquinquepinnata, ovata, usque ad 138 cm longa, herbacea. Pinnulae primariae pleraque in positione catadromica portatae. Pinnae basales amplissimae, usque ad 64 cm longae, petiolus usque ad 10 cm longis, pinnula basali basiscopici usque ad 31.5 cm longa. Pinnulae ultimae apice rotundatae denticulatae, lateribus lobatae vel dentatae, lobis acutis erectopatentibus usque fere patentibus. Costae, costulae venaque infra pilis persistentibus multiseptatis appressis praeditae. Sori medialis, indusia 0.5–1 mm diametro, glabra. Paraphyses inconspicuae, hyalinae, non capitatae.

HOLOTYPE: Luzon, Mt Santo Tomas, Price 1611 (PNH).

Rhizome stout, erect. Paleae to  $42 \times 7$  mm, long-acuminate above a relatively broad lower portion, brown, concolorous, margins with small blunt projections consisting of the outcurved portion of one cell or two adjacent cells. Stipe light brown, with smaller narrower paleae, to 103 cm long and 12 mm thick, with 15 vascular bundles near base, the two adaxial on either side of the stipe-groove much the largest. Lamina ovate, to 138 cm long, olive-green, herbaceous, quadripinnate or subquinquepinnate at base, pinnae and major pinnules long acuminate, most or all pinnae with basal primary pinnules in catadromic position, secondary pinnules in anadromic position except sometimes for the larger ones of basal pinnae, tertiary pinnules and quaternary segments nearly all in anadromic position. Major axes beneath with deciduous narrow fibrils, persistent appressed reddish-brown multi-septate hairs c. 0.3 mm long borne along costae, costules and veins beneath, sometimes a few on upper surface. Basal pinnae largest, to 64 cm long on stalks to 10 cm long, basal basiscopic pinnule to 31.5 cm, stalk to 1.8 cm, not very much larger than the succeeding, basal acroscopic pinnule to 20.5 cm, very slightly shorter than the several succeeding. Largest secondary pinnule 10 cm long, tertiary pinnules to  $2.5 \times 1.7$  cm, largest quaternary pinnules broadly adnate or connate, to  $10 \times 5$  mm. Third pair of pinnae from base 45 cm long, fifth pair 33 cm long with stalk 2 cm, tenth pair 12 cm long, ultimate pinnules with broad blunt denticulate apices and spreading-ascending pointed lobes or teeth. Sori about medial, indusia 0.5–1 mm across, brown, glabrous, paraphyses shorter than sporangia, apices hyaline, not or hardly expanded.

LUZON. Mt Polis, Oliver PNH 30576; Mt Data, Ramos & Edaño BS 40285 (US); Mt Pauai, Sulit PNH 5120 (MICH); Bontoc, Ramos & Edaño BS 37834 (US), 37847 (US), 37985 (US), 38064 (US); Mt Ugo, Ramos BS 5777 (MICH, NY, US); Haight's Place, Mearns BS 4194 (MICH, US); Baguio, Loher 832 (US); Mt Santo Tomas, Price 1611, 1862.

*Ecology:* Terrestrial in mountain forest, 1400–2200 m.

*Notes:* Ramos & Edaño BS 37847, very congested and nearly glabrous, is placed here with some doubt. This species, apparently endemic to Luzon, is very similar to Polynesian specimens of *D. arborescens* (Bak.) O. Ktze., which is characterized by broad pale brown paleae on costae, the paleae attached parallel to the costa.

Another similar Polynesian plant, *D. maxima* (Bak.) C. Chr., is anadromous, very finely dissected, with supramedial sori. Some New Guinean specimens are similar to those of Polynesia; none are quite the same as anything in the Philippines.

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